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Microbial characterization of solid-wastes treated with Heat Melt Compaction technology. By: Richard F. Strayer, Mary E. Hummerick, Jeffrey T. Richards, LaShelle E. McCoy, Michael S. Roberts, (all ESC) and Raymond M. Wheeler (NASA)

ABSTRACT: The research purpose of the project was to determine the fate of microorganisms in space-generated solid wastes after processing by a Heat Melt Compactor (HMC), which is a candidate solid waste treatment technology. Five HMC product disks were generated at Ames Research Center (ARC), Waste Management Systems element. The feed for two was simulated space-generated trash and feed for three was Volume F compartment wet waste returned on STS 130. Conventional microbiological methods were used to detect and enumerate microorganisms in HMC disks and in surface swab samples of HMC hardware before and after operation. Also, biological indicator test strips were added to the STS trash prior to compaction to test if HMC processing conditions, 150 C for ~ 3 hr and dehydration, were sufficient to eliminate the test bacteria on the strips. During sample acquisition at KSC, the HMC disk surfaces were sanitized with 70% alcohol to prevent contamination of disk interiors. Results from microbiological assays indicated that numbers of microbes were greatly reduced but not eliminated by the 70% alcohol. Ten 1.25 cm diameter cores were aseptically cut from each disk to sample the disk interior. The core material was run through the microbial characterization analyses after dispersal in sterile diluent. Low counts of viable bacteria (5 to 50 per core) were found but total direct counts were 6 to 8 orders of magnitude greater. These results indicate that the HMC operating conditions might not be sufficient for complete waste sterilization, but the vast majority of microbes present in the wastes were dead or non-cultivable after HMC treatment. The results obtained from analyses of the commercial spore test strips that had been added to the wastes prior to HMC operation further indicated that the HMC was sterilizing the wastes. Nearly all strips were recovered from the HMC disks and all of these were negative for spore growth when run through the manufacturer's protocol. The 10⁶ or so spores impregnated into the strips were no longer viable. Control test strips, i.e., not exposed to the HMC conditions, were all strongly positive. All isolates from the cultivable counts were identified, leading to one concern: several were identified as *Staphylococcus aureus*, a human pathogen. The project reported here provides microbial characterization support to the Waste Management Systems element of the Life Support and Habitation Systems program.